The Snake River

Responses to Jackson Lake Dam

History of Jackson Lake Dam

- Log crib dam build at the outlet of natural Jackson Lake in 1906. Structure failed in 1910.
- Larger structure completed in 1917 which raised the natural lake level by 39 feet.

Operations of Jackson Lake Dam during the spring runoff season

- Decisions about releases from Jackson Lake and Palisades are made on a daily basis based on daily inflow and seasonal projections. Releases subsequent to spring snowmelt balance objectives that include reservoir boating, white-water rafting, scenic floating the park, fishing interests and special requests of the WYG&F Dept.

Operations of Jackson Lake Dam during the fall and winter

- Releases are set at the greater of either 280 cfs or the computed inflow to the lake if the lake elevation is higher than 6760.95 AMSL

Typical Operating Scenario of Jackson Lake Dam

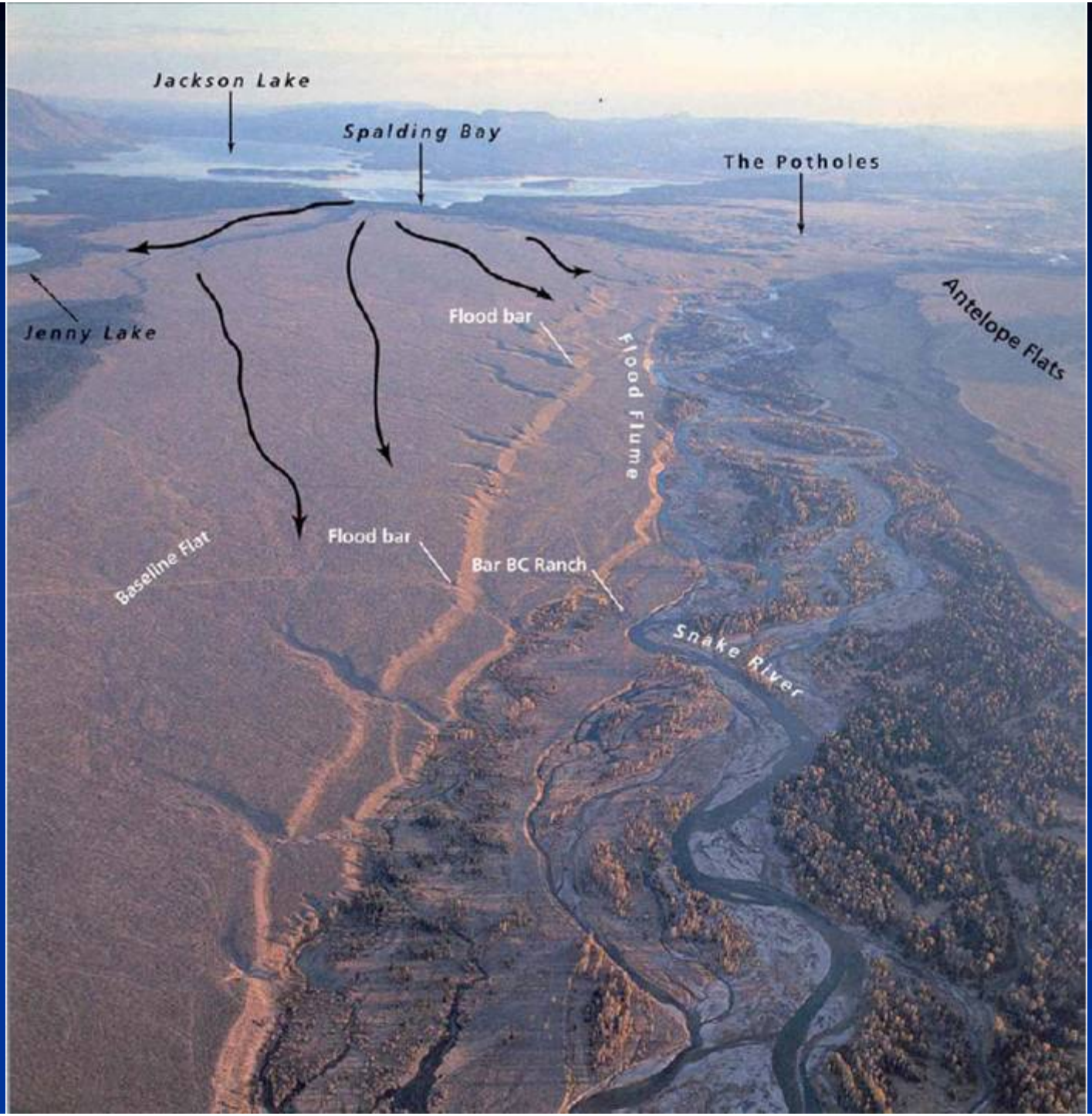
- Jackson Lake is maintained near its full capacity as long as possible to prolong the reservoir boating season
- As natural runoff subsides, dam releases are increased to facilitate white-water and scenic boating downstream and to move water into Palisades Reservoir
- The BOR tries to establish a flow that can be sustained through September 30th, to move a total volume of 200,000 acre-feet of water downstream

Why should we care?

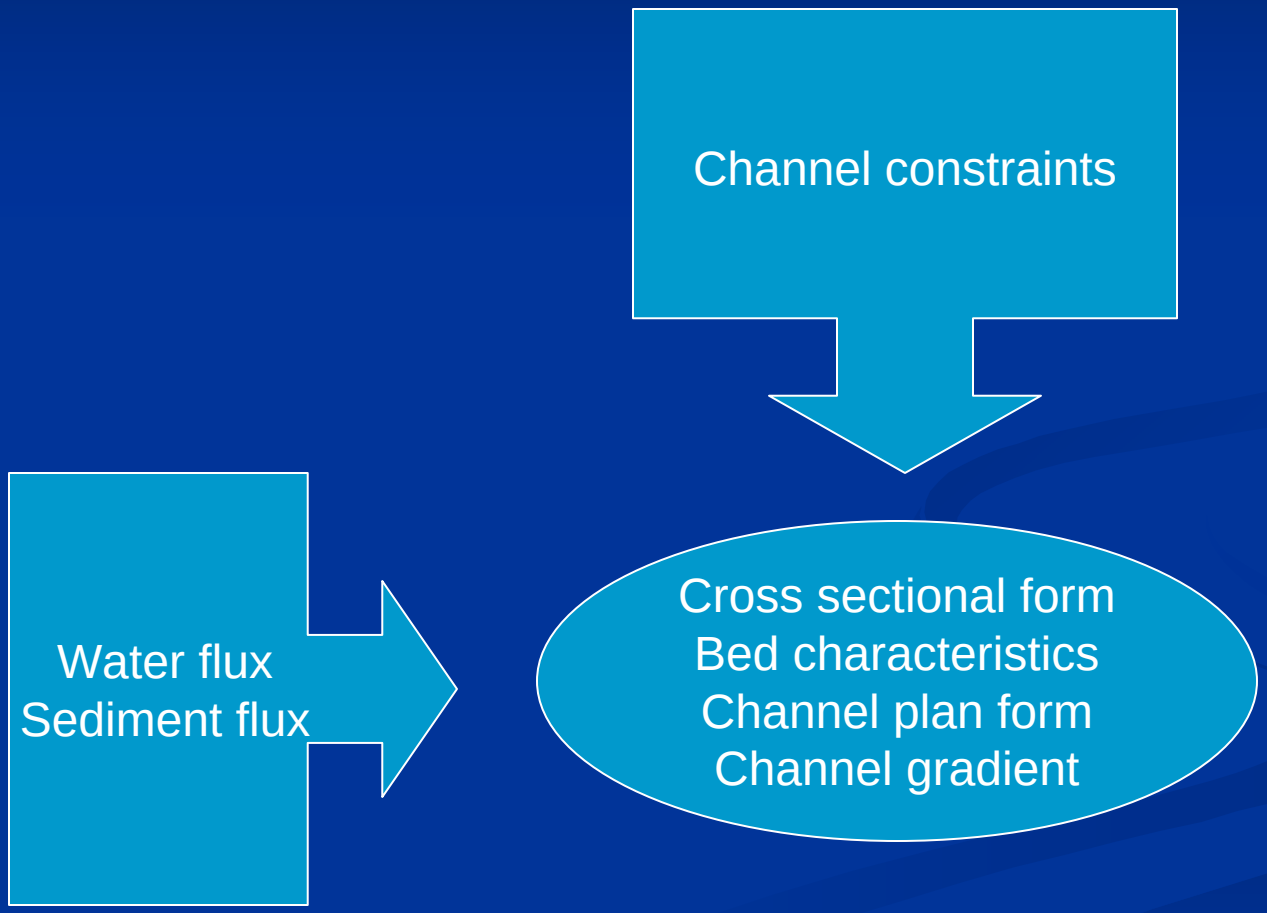
- The mission of the National Park Service is to preserve unimpaired the natural and cultural resources and values of the national park system for the enjoyment and inspiration of this and future generations (Organic Act, 1916).

The Effects of Dams on Rivers

- Dams alter the flux of water and the flux of sediment in the channel downstream
- Decisions about reversing undesired channel conditions downstream from dams must be based on a combination of natural science, engineering, and public policy


Jackson Lake
Spalding Bay
The Potholes
Jenny Lake
Flood bar
Antelope Flats
Flood Flume
Baseline Flat
Flood bar
Bar BC Ranch
Snake River

Conceptual Model of the Determinants of Channel Flow



What are we doing?

- In 2003, Grand Teton National Park successfully competed for RM-CESU funding to prepare a preliminary study plan for data collection, monitoring needs, etc. that would lead to the development of science based recommendations for potentially changing Jackson Lake Dam reservoir release schedules

What are we doing?

- Also through competitive sources, additional funding was obtained with support from local organizations (Jackson Hole One-Fly, Wyoming Game and Fish) to augment the initial study and to include a detailed review of historical streamflow change and variability along with an aerial photograph analysis of channel change.

What are we doing?

- Beginning in ’05, a 2-year study (WRD-Competitive) will develop a set of river management objectives that will guide the NPS in future negotiations with the Bureau of Reclamation. The work completed this year serves as the foundation for this project
- USGS 5-year ($172K/yr) GYA Initiative to study effects of dam on riparian communities

It is essential that NPS have a full understanding of the decadal, annual, seasonal, and daily characteristics of streamflow that have been altered by Jackson Dam.

Part A: Analysis of stream flow changes

- Historical streamflow change and variability
- Wavelet analysis of the measured streamflow record of the Snake River near Moran
- Indicators of Hydrologic Alteration

Part B: aerial photograph analysis of channel change since 1989

- Recent (1995-2001)aerial photographs for Grand Teton will be compared with 1989 photos to determine if change continues and is progressive. Areas of channel narrowing and bed aggradation will be documented (below Pacific Creek, Buffalo Fork, and Spread Creek, and below any big cut banks).

High flows of 1997 will be analyzed to answer the following questions :

- Did the high releases remove areas of aggradation?
- Or did the tribs dump in more than could be removed?
- If unusual high flows can't get rid of these deposits, how can more moderate dam releases?

Part C: Areas of channel narrowing will be surveyed, mapped, excavated, analyzed to determine:

- the extent of the undesired deposits, grain sizes, the extent to which they are protected from scouring flows
- what has happened to these places in past high flows?
- what are the hydraulic conditions at these sites during low and high flows?

Study emphasis:

- Have bad things happened?
- Can we map and measure these things so as to present them to the Bureau in a convincing way so that something can be done?
- If high flows are provided, will anything happen?
- Work will include mapping of the channel bathymetry and channel margin topography, careful bed and bank material measurements, mapping of the riparian vegetation and its root density and modeling of the likely flow conditions during high flows.

Part D: Develop a plan for flow regimes and surface manipulation to reverse undesired channel changes

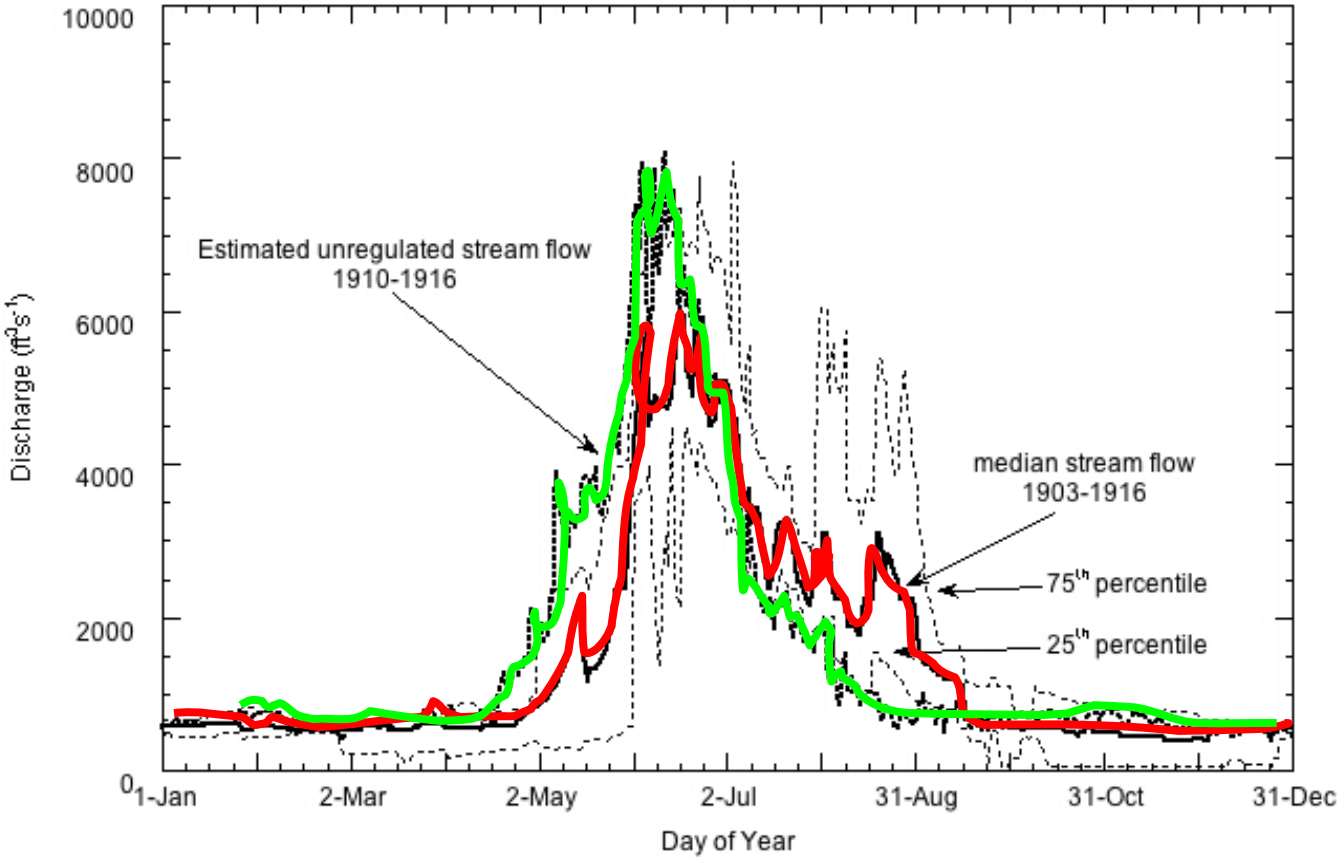
- Establish target discharges at multiple sites that will achieve desired goals, presumably reverse channel narrowing and increase frequency of channel avulsions
- Estimate bed and bank shear stresses necessary to achieve management goals.
- Determine if the same range of flows is the target for every site.

A first step in this process is to fully engage the Bureau of Reclamation in the development of a detailed study plan. It is critical that this project be a cooperative effort with the BOR to help identify stakeholders, develop boundaries and identify operational limitations.

Results to date:

- Discharge data can be divided into 3 analysis periods
  - 1903-1916 representing years before a permanent dam was built
  - 1917-1956 representing years following the construction of a permanent dam and establishment of the present maximum full pool elevation
  - 1957-2002 representing years following construction of the Palisades Reservoir

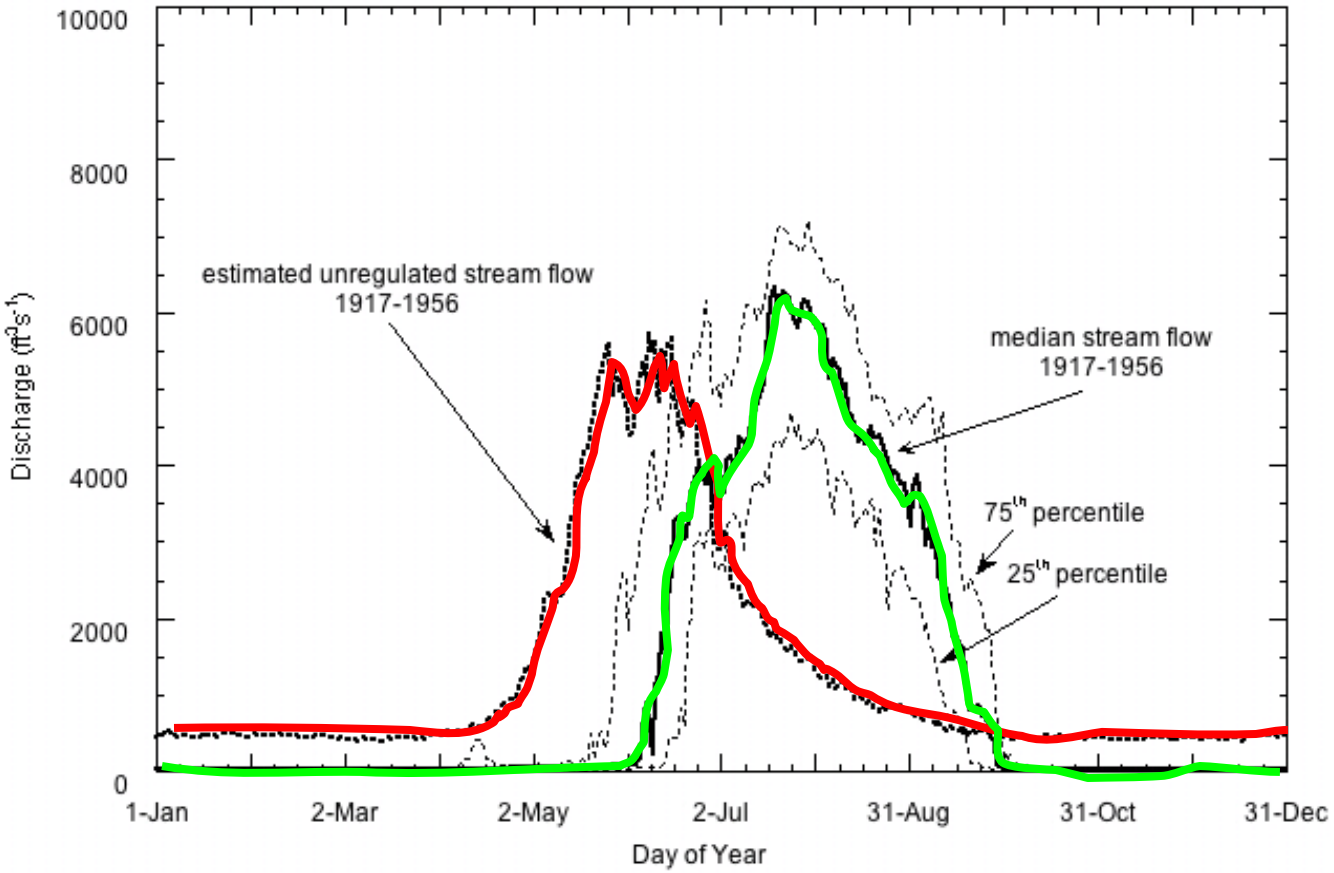
Figure 5. -- Comparison of the actual measured discharge and the estimated unregulated discharge of the Snake River near Moran, WY, for the period before completion of the permanent Jackson Lake Dam in 1917.



1903-1916

- The natural hydrology of the Snake River was altered as soon as the first dam was constructed at Jackson Lake in 1906
- The greatest divergence between the est. unregulated flow and the actual discharge was the decreased stream flow during the rise of the annual snowmelt flood in May and increased stream flow between mid-July and mid-September

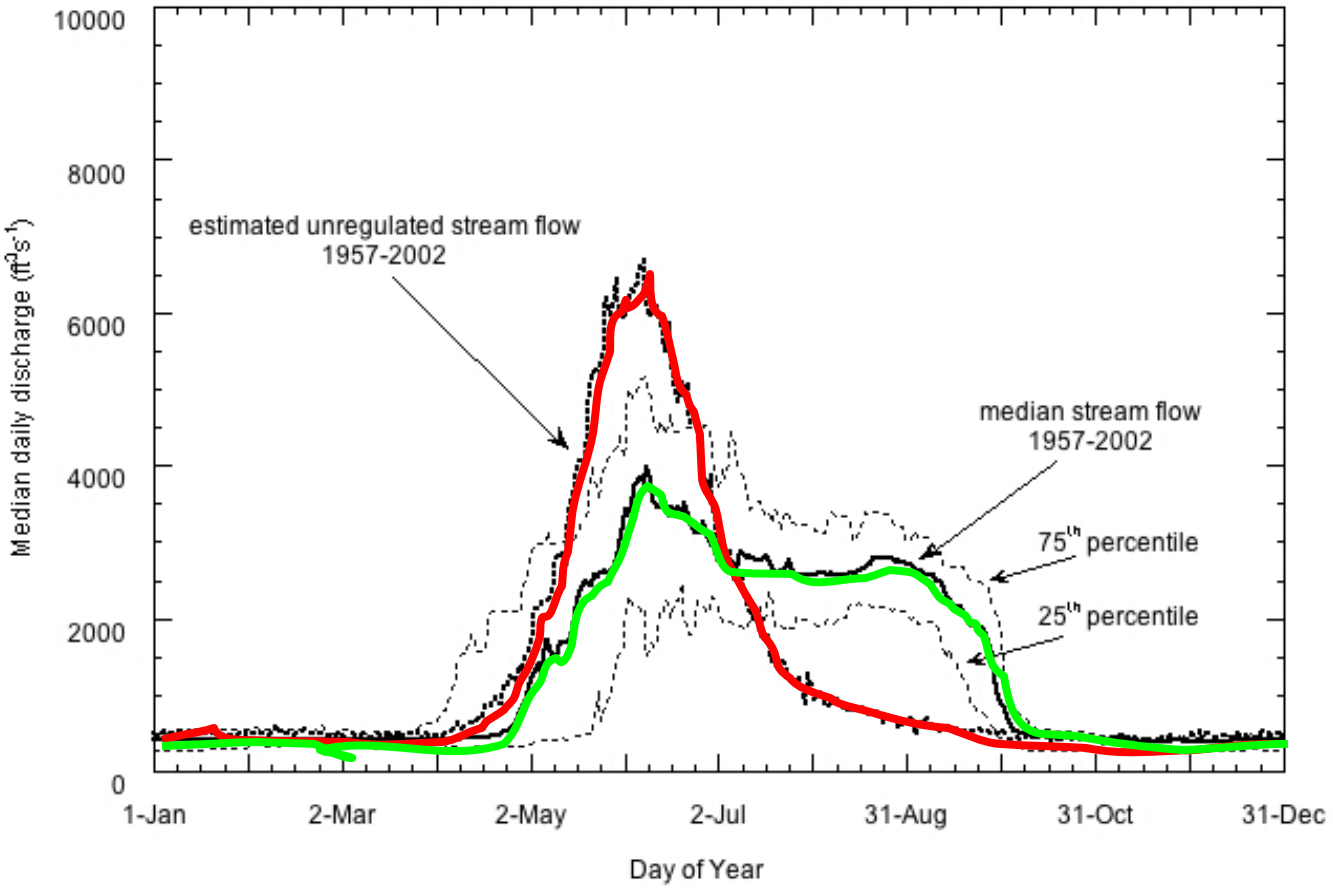
Figure 6. -- Comparison of the actual measured discharge and the estimated unregulated discharge of the Snake River near Moran, WY, for the period 1917 to 1956.



1917-1956

- The annual flood was artificially delayed about 2 months
- Magnitude of this flood was about the same as the estimated unregulated flow would have been
- Unregulated flow characterized by slower recession

Figure 7. -- Comparison of the actual measured discharge and the estimated unregulated discharge of the Snake River near Moran, WY, for the period 1957 to 2002.



1957-2002

- The magnitude of the annual flood has been greatly reduced
- The timing of the annual peak flow is now nearly the same as would have been the estimated unregulated flow
- Stream flow has been kept nearly steady between about July 1 and September 15th
- Subsequent base flows are approximately what they would have been without the dam

Contact information

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